60-62, 64, 66-68, 70, 72-73, 75-76, 78-79, 81-85, 87-90, 92, 94-98, 100-103 and 107-108 have been amended, and new claims 119-129 have been added to better encompass the full scope and breadth of the invention. Notwithstanding these actions, Applicant believes that the claims would have been allowable as originally filed. Applicants assert that no new matter has been added and no claims have been narrowed within the meaning of *Festo*. Accordingly, claims 23-29 and 31-129 are now pending in the present application and, for the reasons set forth below, are believed to be in condition for allowance.

Initially, the *Office Action* rejects claims 23-29, 31-50 and 58-118 pursuant to 35 U.S.C. §112, second paragraph as indefinite. Due to the above actions, the rejected claims have been amended to substitute the term --as-- for "with", and the second recitation of "amorphous silicon" has been deleted, as the Examiner suggested. Claims 25, 27, 29, 64, 76, 87, 98 have been amended to provide clarity and antecedent basis for the recitation "radio frequency energy". Claims 92 and 98 have been amended to provide antecedent basis for the recitation "radio frequency discharge" and to recite that the gate insulating film adjacent to the semiconductor film. Claims 58, 64, 70, 76, 82, 87, 92 and 98 have been amended to remove from their respective preambles the limitation "comprising a semiconductor layer having at least a channel formation region, a gate insulating film adjacent to said semiconductor layer, and a gate electrode adjacent to said gate insulating film". Claims 107 and 108 have been amended so that the recitation "said hydrogen gas" now recites --said discharge gas--. Accordingly, reconsideration and withdrawal of the pending rejection is respectfully solicited.

The *Office Action* rejects claims 23-29 and 31-103 pursuant to 35 U.S.C. §112, first paragraph as lacking support in the specification of certain claimed subject matter. Due to the above actions, the rejected claims have been amended to remove the term "comprising", and the recitations "amorphous film comprising silicon" and "comprising

amorphous silicon" have been deleted. Claims 25, 27 and 29 have been amended to recite --using radio frequency energy supplied in said one of said chambers--. Claims 28 and 29 have been amended to include the recitation --as a multilayer--. Accordingly, no new matter has been presented. Reconsideration and withdrawal of the pending rejection is respectfully solicited.

The *Office Action* rejects claims 23-29, 45-49, 61-65, 67-82, 84-87, 89-104, 106-110 and 113-118 under 35 U.S.C. §103(a) as being unpatentable over ***Kozuka '044*** in view of ***Gupta et al. '796***. Applicant respectfully traverses the grounds for rejection for at least the reasons solicited hereinbelow. Accordingly, reconsideration and withdrawal of the pending rejections is respectfully solicited.

The claimed invention is directed to a film forming method for fabricating a thin film transistor. More particularly, the claimed invention is directed to a method of forming a film such as a semiconductor film by a plasma CVD method, whereby a discharge gas such as hydrogen is supplied into a chamber to cause a radio frequency discharge. When the radio frequency discharge becomes stable, a reactive gas such as silane is supplied into the chamber at the same rate as the supply of discharge gas to form the semiconductor film by decomposing the reactive gas, and whereby the supply of the discharge gas is stopped during the film formation. Consequently, it is possible to eliminate an instability at a start of the radio frequency discharge, and the film formation can be carried out in a state where the radio frequency discharge is always stable. Moreover, the supply of the reactive gas is stopped in a state where the radio frequency discharge is maintained, and a discharge gas is supplied into the chamber at the same flow rate as the reactive gas. For a predetermined time period, plasma without the film formation is formed in the chamber. The radio frequency is stopped in a state where minute particles in the chamber are exhausted. In this manner, the state where the minute particles do not adhere to the formed surface can be made.

As the Examiner well knows, three criteria must be met to establish a *prima facie* case of obviousness. *M.P.E.P.* §2143. First, there must be some teaching, suggestion, or motivation to combine or modify the teachings of the prior art to produce the claimed invention, found either in the references themselves or in the knowledge generally available to a skilled artisan. *In re Fine*, 837 F.2d 1071, 5 USPQ.2d 1596 (Fed. Cir. 1988). Second, there must be a reasonable expectation of success. *In re Rhinehart*, 531 F.2d 1048, 189 USPQ 143 (CCPA 1976). And third, the prior art must teach or suggest all the claim limitations. *In re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA 1974).

Applicant respectfully contends that the rejection is improper since the ***Kozuka '044*** patent teaches away from the claimed invention. A *prima facie* case of obviousness may be rebutted by showing the art, in any material respect, teaches away from the claimed invention. *In re Geisler*, 116 F.3d 1465, 1471, 43 USPQ2d 1362 (Fed. Cir. 1997). A prior art reference that teaches away from the claimed invention is a significant factor to be considered in determining obviousness. M.P.E.P. §2145. In the instant case, the *Office Action* contends that the diluting gas in ***Kozuka '044*** is equivalent to the discharge gas of the claimed invention. The discharge gas of the claimed invention, however, is stopped when the supply of the reactive gas is started because the discharge gas (hydrogen gas) lowers the quality of the semiconductor film if excessively taken into the semiconductor film (*See*, page 20, lines 2-6 of the specification). On the other hand, the diluting gas of ***Kozuka '044*** is necessarily used during the film formation. (Col. 4, lines 40-42). Furthermore, the claimed invention involves supplying a reactive gas <u>at the same flow rate</u> as the discharge gas, whereas ***Kozuka '044*** teaches the introduction of a raw material gas and hydrogen gas with respective flow rates of 10 sccm and 40 scm (Col. 5, lines 53-56), and thus, teaches away from the claimed invention. And ***Gupta et al. '796*** fails to teach flow rates of the reactant gas and inert gas. Accordingly, the

claimed invention cannot be obtained even if ***Kozuka '044*** and ***Gupta et al. '796*** were properly combined.

Moreover, the *Office Action* contends that it would have been obvious to one of ordinary skill in the art, that the diluting gas of ***Kozuka '044*** need not have been mixed with the reactant gas by combining the teachings of ***Gupta et al. '796***. ***Kozuka '044*** teaches, however, that the raw material gas is preferably used <u>not singly but as a mixture</u> with the diluting gas during film formation. (Col. 4, lines 40-42). Thus, the contention by the examiner is improper in that it teaches away from the actually teaches what is expressly disclosed in ***Kozuka '044***. Moreover, there is a lack of motivation to combine the teachings of ***Kozuka '044*** and ***Gupta et al. '796*** since ***Gupta et al. '796*** teaches away from ***Kozuka '044***. Accordingly, Applicant respectfully submits that ***Kozuka '044*** or ***Gupta et al. '796***, either alone or in combination, teaches, discloses or suggests every feature set forth in the claimed invention.

Accordingly, Applicant respectfully contends that the claimed invention is directed to subject matter which is patentably distinct over the prior art and also submit that the pending claims are in proper condition for allowance and reconsideration and withdrawal of the pending rejection is requested. If the Examiner believes further discussions with Applicants representative would be beneficial in this case, he is invited to contact the undersigned.

Respectfully submitted,

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Marked-up copy of amended claims.

23. (Amended) A film forming method comprising the steps of:

supplying hydrogen gas into a chamber;

supplying radio frequency energy in said chamber to generate plasma from said hydrogen gas by radio frequency discharge;

supplying a reactive gas into said chamber at a same flow rate [with] as supplying said hydrogen gas; and

forming a semiconductor film [comprising amorphous silicon] over a substrate in said chamber by decomposing said reactive gas using said radio frequency energy,

wherein the step of supplying said hydrogen gas is discontinued with a start of the step of supplying said reactive gas and throughout the forming of said semiconductor film [comprising amorphous silicon].

24. (Amended) A film forming method comprising the steps of:

forming an under film on a substrate;

supplying hydrogen gas into a chamber;

supplying radio frequency energy in said chamber to generate plasma from said hydrogen gas by radio frequency discharge;

supplying a reactive gas into said chamber at a same flow rate [with] as supplying said hydrogen gas; and

forming a semiconductor film [comprising amorphous silicon] on said under film in said chamber by decomposing said reactive gas using said radio frequency energy,

wherein the step of supplying said hydrogen gas is discontinued with a start of the step of supplying said reactive gas and throughout the step of forming of said semiconductor film [comprising amorphous silicon].

25. (Amended) A film forming method comprising <u>the steps of</u>:

forming a semiconductor film [comprising amorphous silicon] <u>over a substrate</u> in a chamber by decomposing a reactive gas using radio frequency energy <u>supplied in said chamber</u>;

supplying hydrogen gas into said chamber at a same flow rate [with] <u>as</u> supplying said reactive gas; and

supplying <u>said</u> radio frequency energy to said hydrogen gas to generate plasma from said hydrogen gas in said chamber by radio frequency discharge,

wherein said reactive gas is supplied into said chamber during the step of forming of said semiconductor film [comprising amorphous silicon] before the step of supplying said hydrogen gas, and the step of supplying said hydrogen gas is started with discontinuing a supply of said reactive gas.

26. (Amended) A film forming method comprising <u>the steps of</u>:

supplying a discharge gas into a chamber;

supplying radio frequency energy in said chamber to generate plasma from said discharge gas by radio frequency discharge;

supplying a reactive gas into said chamber at a same flow rate [with] <u>as</u> supplying said discharge gas; and

forming a semiconductor film [comprising amorphous silicon] <u>over a substrate</u> in said chamber by decomposing said reactive gas using said radio frequency energy,

wherein the step of supplying said discharge gas is discontinued with a start of the step of supplying said reactive gas and throughout the step of forming of said semiconductor film [comprising amorphous silicon], and

wherein said discharge gas does not contribute to film formation.

27. (Amended) A film forming method comprising the steps of:

forming a semiconductor film [comprising amorphous silicon] over a substrate in a chamber by decomposing a reactive gas using radio frequency energy supplied in said chamber;

supplying a discharge gas into said chamber at a same flow rate [with] as supplying said reactive gas; and

supplying said radio frequency energy to said discharge gas to generate plasma from said discharge gas in said chamber by radio frequency discharge,

wherein said reactive gas is supplied into said chamber during the step of forming of said semiconductor film [comprising amorphous silicon] before the step of supplying a discharge gas, and the step of supplying said discharge gas is started with discontinuing supplying said reactive gas, and

wherein said discharge gas does not contribute to film formation.

28. (Amended) A film forming method for forming a plurality of different films as a multilayer in a multichamber apparatus comprising a plurality of chambers coupled to each other, said method comprising the steps of:

supplying hydrogen gas into one of said chambers;

supplying radio frequency energy in said one of said chambers to generate plasma from said hydrogen gas by radio frequency discharge;

supplying a reactive gas into said one of said chambers at a same flow rate [with] as supplying said hydrogen gas; and

forming a semiconductor film [comprising amorphous silicon] over a substrate as one of said different films in said one of said chambers by decomposing said reactive gas using said radio frequency energy therein,

wherein the step of supplying said hydrogen gas is discontinued with a start of the step of supplying said reactive gas and throughout the step of forming of said semiconductor film [comprising amorphous silicon], and wherein each of said chambers forms at least one of said plurality of different films.

29. (Amended) A film forming method for forming a plurality of different films as a multilayer in a multichamber apparatus comprising a plurality of chambers coupled to each other, said method comprising the steps of:

forming a semiconductor film [comprising amorphous silicon] over a substrate as one of said different films in one of said chambers by decomposing a reactive gas using radio frequency energy supplied in said one of said chambers;

supplying hydrogen gas into said one of said chambers at a same flow rate [with] as supplying said reactive gas; and

supplying said radio frequency energy to said hydrogen gas to generate plasma from said hydrogen gas in said one of said chambers by radio frequency discharge,

wherein said reactive gas is supplied into said chamber during the step of forming of said semiconductor film [comprising amorphous silicon] before the step of supplying said hydrogen gas, and the step of supplying said hydrogen gas is started with discontinuing the supplying of said reactive gas, and wherein each of said chambers forms at least one of said plurality of different films.

31. (Amended) A method according to claim 23 wherein said semiconductor film [comprising amorphous silicon] is crystallized by irradiating a laser light, and [a] said crystallized semiconductor film is used for fabricating a thin film transistor.

32. (Amended) A method according to claim 24 wherein said semiconductor film [comprising amorphous silicon] is crystallized by irradiating a laser light, and [a] said crystallized semiconductor film is used for fabricating a thin film transistor.

33. (Amended) A method according to claim 25 wherein said semiconductor film [comprising amorphous silicon] is crystallized by irradiating a laser light, and [a] said crystallized semiconductor film is used for fabricating a thin film transistor.

34. (Amended) A method according to claim 26 wherein said semiconductor film [comprising amorphous silicon] is crystallized by irradiating a laser light, and [a] said crystallized semiconductor film is used for fabricating a thin film transistor.

35. (Amended) A method according to claim 27 wherein said semiconductor film [comprising amorphous silicon] is crystallized by irradiating a laser light, and [a] said crystallized semiconductor film is used for fabricating a thin film transistor.

36. (Amended) A method according to claim 28 wherein said semiconductor film [comprising amorphous silicon] is crystallized by irradiating a laser light, and [a] said crystallized semiconductor film is used for fabricating a thin film transistor.

37. (Amended) A method according to claim 29 wherein said semiconductor film [comprising amorphous silicon] is crystallized by irradiating a laser light, and [a] said crystallized semiconductor film is used for fabricating a thin film transistor.

45. (Amended) A method according to claim 23 wherein a period of time from a start of said radio frequency discharge [of] to said start of the supply of said reactive gas is 10 seconds.

46. (Amended) A method according to claim 24 wherein a period of time from a start of said radio frequency discharge [of] to said start of the supply of said reactive gas is 10 seconds.

47. (Amended) A method according to claim 28 wherein a period of time from a start of said radio frequency discharge [of] to said start of the supply of said reactive gas is 10 seconds.

48. (Amended) A method according to claim 23 wherein a time chart in said film forming is $10t \geq T$ where t is a largest period of time selected among periods of time corresponding to an unstable discharge state at a start of discharge, and where T is a period of time of the forming of said semiconductor film [comprising amorphous silicon].

49. (Amended) A method according to claim 24 wherein a time chart in said film forming is $10t \geq T$ where t is a largest period of time selected among periods of time corresponding to an unstable discharge state at a start of discharge, and where T is a period of time of the forming of said semiconductor film [comprising amorphous silicon].

50. (Amended) A method according to claim 26 wherein a time chart in said film forming is 10t≥T where t is a largest period of time selected among periods of time corresponding to an unstable discharge state at a start of discharge, and where T is a period of time of the forming of said semiconductor film [comprising amorphous silicon].

58. (Amended) A film forming method for fabricating a thin film transistor [comprising a semiconductor layer having at least a channel formation region, a gate insulating film adjacent to said semiconductor layer, and a gate electrode adjacent to said gate insulating film, said method] comprising the steps of:

supplying a discharge gas into a chamber;

supplying radio frequency energy in said chamber to generate plasma from said discharge as by radio frequency discharge;

supplying a reactive gas into said chamber at a same flow rate [with] as supplying said discharge gas; and

forming [said] a gate insulating film over an insulating substrate in said chamber by decomposing said reactive gas using said radio frequency energy,

wherein said discharge gas is not supplied during the step of supplying said reactive gas and throughout the forming of said gate insulating film.

60. (Amended) A method according to claim 58 wherein said gate insulating film [comprises] is silicon oxide.

61. (Amended) A method according to claim 58 wherein said discharge gas [comprises] is hydrogen.

62. (Amended) A method according to claim 58 wherein said reactive gas [comprises] <u>is</u> silane.

64. (Amended) A film forming method for fabricating a thin film transistor [comprising a semiconductor layer having at least a channel formation region, a gate insulating film adjacent to said semiconductor layer, and a gate electrode adjacent to said gate insulating film, said method] comprising the steps of:

forming [said] <u>a</u> gate insulating film over an insulating substrate in a chamber by decomposing a reactive gas using radio frequency energy <u>supplied in said chamber</u>;

supplying a discharge gas into said chamber; and

supplying <u>said</u> radio frequency energy to said discharge gas to generate plasma from said discharge gas in said chamber by radio frequency discharge at a same flow rate [with] <u>as</u> supplying said reactive gas,

wherein said reactive gas is supplied into said chamber during the step of forming of said gate insulating film before the step of supplying said discharge gas, and said reactive gas is not supplied during the step of supplying said discharge gas.

66. (Amended) A method according to claim 64 wherein said gate insulating film [comprises] <u>is</u> silicon oxide.

67. (Amended) A method according to claim 64 wherein said discharge gas [comprises] <u>is</u> hydrogen.

68. (Amended) A method according to claim 64 wherein said reactive gas [comprises] <u>is</u> silane.

70. (Amended) A film forming method for fabricating a thin film transistor [comprising a semiconductor layer having at least a channel formation region, a gate insulating film adjacent to said semiconductor layer, and a gate electrode adjacent to said gate insulating film, said method] comprising the steps of:

supplying a discharge gas into a chamber;

supplying radio frequency energy in said chamber to generate plasma from said discharge gas by radio frequency discharge;

supplying a reactive gas into said chamber at a same flow rate [with] as supplying said discharge gas; and

forming [said] a semiconductor [layer comprising amorphous silicon] film over an insulating substrate in said chamber by decomposing said reactive gas using said radio frequency energy,

wherein said discharge gas is not supplied during the step of supplying said reactive gas and throughout the forming of said semiconductor [layer comprising amorphous silicon] film.

72. (Amended) A method according to claim 70 wherein said discharge gas [comprises] is hydrogen.

73. (Amended) A method according to claim 70 wherein said reactive gas [comprises] is silane.

75. (Amended) A method according to claim 70 wherein a thickness of said semiconductor [layer] film is 50 nm or less.

76. (Amended) A film forming method for fabricating a thin film transistor [comprising a semiconductor layer having at least a channel formation region, a gate insulating film adjacent to said semiconductor layer, and a gate electrode adjacent to said gate insulating film, said method] comprising the steps of:

forming [said] a semiconductor [layer comprising amorphous silicon] film over an insulating substrate in a chamber by decomposing a reactive gas using radio frequency energy supplied in said chamber;

supplying a discharge gas into said chamber at a same flow rate [with] as supplying said reactive gas; and

supplying said radio frequency energy to said discharge gas to generate plasma from said discharge gas in said chamber by radio frequency discharge,

wherein said reactive gas is supplied into said chamber during the step of forming of said semiconductor [layer comprising amorphous silicon] film before the step of supplying said discharge gas, and said reactive gas is not supplied during the step of supplying said discharge gas.

78. (Amended) A method according to claim 76 wherein said discharge gas [comprises] is hydrogen.

79. (Amended) A method according to claim 76 wherein said reactive gas [comprises] is silane.

81. (Amended) A method according to claim 76 wherein a thickness of said semiconductor [layer] film is 50 nm or less.

82. (Amended) A film forming method for fabricating a thin film transistor [comprising a semiconductor layer having at least a channel formation region, a gate insulating film on said semiconductor layer, and a gate electrode adjacent on said gate insulating film, said method] comprising the steps of:

supplying a discharge gas into a chamber;

supplying radio frequency energy in said chamber to generate plasma from said discharge gas by radio frequency discharge;

supplying a reactive gas into said chamber at a same flow rate [with] as supplying said discharge gas; and

forming an under film on an insulating substrate in said chamber by decomposing said reactive gas using said radio frequency energy,

wherein said discharge gas is not supplied during the step of supplying said reactive gas and throughout the forming of said under film.

83. (Amended) A method according to claim 82 wherein said under film [comprises] is silicon oxide.

84. (Amended) A method according to claim 82 wherein said discharge gas [comprises] is hydrogen.

85. (Amended) A method according to claim 82 wherein said reactive gas [comprises] is silane.

87. (Amended) A film forming method for fabricating a thin film transistor [comprising a semiconductor layer having at least a channel formation region, a gate

insulating film on said semiconductor layer, and a gate electrode on said gate insulating film, said method] comprising the steps of:

forming an under film on an insulating substrate in a chamber by decomposing a reactive gas using radio frequency energy supplied in said chamber;

supplying a discharge gas into said chamber at a same flow rate [with] as supplying said reactive gas; and

supplying said radio frequency energy to said discharge gas to generate plasma from said discharge gas in said chamber by radio frequency discharge,

wherein said reactive gas is supplied into said chamber during the step of forming of said under film before the step of supplying said discharge gas, and said reactive gas is not supplied during the step of supplying said discharge gas.

88. (Amended) A method according to claim 87 wherein said under film [comprises] is silicon oxide.

89. (Amended) A method according to claim 87 wherein said discharge gas [comprises] is hydrogen.

90. (Amended) A method according to claim 87 wherein said reactive gas [comprises] is silane.

92. (Amended) A film forming method for fabricating a thin film transistor [comprising a semiconductor layer having at least a channel formation region, a gate insulating film adjacent to said semiconductor layer, and a gate electrode adjacent to said gate insulating film, said method] comprising the steps of:

supplying a first discharge gas into a first chamber;

supplying first radio frequency energy in said first chamber to generate plasma from said first discharge gas by first radio frequency discharge;

supplying a first reactive gas into said first chamber at a same flow rate [with] as supplying said first discharge gas; and

forming [said] a semiconductor [layer comprising an amorphous silicon] film over an insulating substrate in said first chamber by decomposing said first reactive gas using said first radio frequency energy,

supplying a second discharge gas into a second chamber;

supplying second radio frequency energy in said second chamber to generate plasma from said second discharge gas by second radio frequency discharge;

supplying a second reactive gas into said second chamber at a same flow rate [with] as supplying said second discharge gas; and

forming [said] a gate insulating film [over said insulating substrate] adjacent to said semiconductor film in said second chamber by decomposing said second reactive gas using said second radio frequency energy,

wherein said first and said second discharge gases are not supplied during the step of supplying said first and said second reactive gases and throughout the forming of said semiconductor [layer] film and said gate insulating film.

94. (Amended) A method according to claim 92 wherein said first and said second discharge gases [comprise] are hydrogen.

95. (Amended) A method according to claim 92 wherein said first and said second reactive gases [comprise] are silane.

96. (Amended) A method according to claim 92 wherein a period of time from the start of said first or said second radio frequency discharge to the start of the supply of said first or said second reactive gas is 10 seconds.

97. (Amended) A method according to claim 92 wherein a thickness of said semiconductor [layer] film is 50 nm or less.

98. (Amended) A film forming method for fabricating a thin film transistor [comprising a semiconductor layer having at least a channel formation region, a gate insulating film adjacent to said semiconductor layer, and a gate electrode adjacent to said gate insulating film, said method] comprising the steps of:

forming [said] a semiconductor [layer] film over an insulating substrate in a first chamber by decomposing a first reactive gas using first radio frequency energy supplied in said first chamber;

supplying a first discharge gas into said first chamber at a same flow rate [with] as supplying said first reactive gas; and

supplying said first radio frequency energy to said first discharge gas to generate plasma from said first discharge gas in said first chamber by first radio frequency discharge,

forming [said] a gate insulating film [over said insulating substrate] adjacent to said semiconductor film in a second chamber by decomposing a second reactive gas using second radio frequency energy supplied in said second chamber;

supplying a second discharge gas into said second chamber at a same flow rate [with] as supplying said second reactive gas; and

supplying said second radio frequency energy to said second discharge gas to generate plasma from said second discharge gas in said second chamber by second radio frequency discharge,

wherein said first and said second reactive gases are supplied into said first and said second chambers during the step of forming of said semiconductor [layer] film and said gate insulating film before the step of supplying said first and said second discharge gases, and said first and said second reactive gases are not supplied during the step of supplying said first and said second discharge gases.

100. (Amended) A method according to claim 98 wherein said first and said second discharge gases [comprise] are hydrogen.

101. (Amended) A method according to claim 98 wherein said first and said second reactive gases [comprise] are silane.

102. (Amended) A method according to claim 98 wherein said first or said second radio frequency discharge is continued for 15 seconds after supplying said first or said second discharge gas.

103. (Amended) A method according to claim 98 wherein a thickness of said semiconductor [layer] film is 50 nm or less.

107. (Amended) A method according to claim 26 wherein said flow rate of said [hydrogen] discharge gas is 100 sccm.

108. (Amended) A method according to claim 27 wherein said flow rate of said [hydrogen] discharge gas is 100 sccm.